Sink or Swim Lesson Burken

**Summary:**

In this activity, students investigate water density and how it relates to everything around them. They will also look at congruent cubes with different masses.

**Time:**

2 days

**Objectives:**

The students will investigate the concept of sink or float by investigating different objects in water to test whether they sink or float by collecting and recording data on a graph. Students will connect their findings to other things that sink and float in our world and how those things affect our environment.

**Background information:**

Students have had experience with differences in density, and most can recognize whether or not two different objects have different densities, but many mistake these differences for differences in weight. A rock feels heavier than a piece of plastic foam that is actually the same weight because the rock is denser. Density is related to the mass and volume of an object. It is measures of how compact something is, or how closely packed the particles are. Materials with closely packed molecules are more dense than materials with loosely packed molecules. The density of an object is calculated by dividing its mass by its volume (density = mass ÷ volume). Gold is nearly four times denser than pyrite. Gold feels heavier than pyrite because it is denser.

An object’s relative density affects its buoyancy and how well it will sink or float. Buoyancy also depends on the density of the liquid. Mass is generally measured in grams and volume in cubic centimeters.

**Materials:**

Density Cubes, crayon, paper clip, pencils, ping pong ball, marble, cork, math cubes, flip camera.

**Set (Engage):**

Have you ever dropped a fork or straw into a sink full of water? Did they sink or float? How about throwing a stone or Frisbee into a creek? Do they sink or float? How do you know what will sink and what will float?

* Watch: “Who Sank the Boat” <http://www.youtube.com/watch?v=OsYb1YSYR34>

Read the following scenario aloud to the students while they follow along. Discuss the scenario with the students and have them take notes in their journal (may use Today’s Tweet or Type With Me).

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| Sink or Swim  Yesterday, I went to the beach in Galveston, Texas. As I looked out over the ocean, I saw some of the same items that had washed up on shore floating. Then I went into the ocean, felt around on the bottom and found more items. I started to wonder why some items ended up on the bottom of the ocean and some floated on top of the water.  *The United States has a very big crisis when it comes to trash in the oceans*. The trash in the oceans is harming wildlife. Birds are getting caught up in the trash floating on the surface. Crabs are getting caught up on trash that has sunk to the bottom. |

**Explore (Independent Practice/Inquiry):**

* 1. Give the students a crayon, paper clip, pencils, ping pong ball, marble, cork, math cube. Have students document with ***flip camera.***
     1. Ask them to predict which will sink/float and record on data sheet. (prepare data sheet)
     2. Have them test each item at least three times for reliability and record on data sheet.
     3. What was it that made some objects float and some sink? Or what properties did the objects have that made them sink or float?
  2. Give each group a set of density cubes. (same size, same shape, different mass)
     1. Ask them to predict which will sink/float and record on data sheet.
     2. Have them test each item and record on data sheet.
     3. What was it that made some objects float and some sink? Or what properties did the objects have that made them sink or float?
  3. Introduce the students to the term relative ***density*** and explore what it means in a qualitative sense. Explain that denser objects feel heavier than less dense objects because they are more compact. Show students a piece of Styrofoam or plastic and a piece of rock that have the same weight. Pass them around for the students to feel. Ask the students which they think is heavier. Chances are they might think that the rock is heavier. Then weigh both objects to show that they have the same mass. Explain that the reason the rock feels heavier is because it is denser.
  4. Wood has a relative density that is less than the relative density of copper. I know this because a toothpick floats in water but a penny sinks.
  5. Students should record their own example in their journal. They should share this with a partner.
  6. Assess Preconceptions and Activate Prior Knowledge:Ask students what they already know about density and have them describe examples of relative density they have witnessed or experienced. This may be a difficult concept, so provide some examples to get them thinking. Have they ever used a kickboard, inner tube, floaties, or a life jacket while swimming? Perhaps they have thrown stones into a river or pond and watched them sink immediately. Or maybe they have noticed that when they add oil to water, the oil rises back up to the top. Ask them to hypothesize about why some objects float and some sink. Finally, ask the students if they have any questions about density, but don’t give away answers that will be addressed during this activity. Write these questions on chart paper or a board to reference later. Let them discover the answers for themselves through investigation.

**Explain:**

* 1. The big scientific word we use to determine whether or not something will float or sink is density. Density is a measurement of the compactness of matter. Another way to say it is the amount of matter per unit of volume (how much material is packed into one object). Density is sometimes thought of as the “lightness” or “heaviness” of a substance.
  2. If you picked up a feather, most of you would probably guess that it would float on water. That’s because it feels so “light”. On the other hand, if you picked up a 150 g weight, you would probably guess that it would sink in the water. The weight would feel too “heavy” to float, right? Well, density is the scientific way to measure this “lightness” or heaviness.” Even if I had one hundred pounds of feathers, they would still float because the relative density of feathers is less than water.
  3. Today we are going to test our “density skills” and figure out how to know when objects will float or sink in water. Remember, just because something is “large” or weighs a lot, doesn’t mean that it will sink and just because something is “small” or light weight, doesn’t mean that it will float. Density isn’t about an object’s size, it’s about the object’s “density.” After all, the beach ball, no matter how big or heavy it is, does float because its density is less than the density of the water.
  4. Sometimes an object has similar density to the water it is in. What do you think will happen to that object? Will it float or sink? If a substance has similar density to the water it is in, it will neither sink nor float to the top. Instead, that substance or object will be suspended in the middle of the water (kind of hovering).
  5. Knowing the density of water will help you to know about all other objects and substances. The density of water is baseline for knowing if things will sink or float. If I asked you about several of different items, could you predict if they would sink or float? Could you predict if they were more or less dense than water?
  6. Well today, that is exactly what we are going to do!

**Elaborate (Technology Integration):**

1. The students will then use a virtual lab to look test whether items sink or float. <http://phet.colorado.edu/sims/density-and-buoyancy/density_en.html>
2. Each group will prepare a presentation to explain relative sinking and floating using technology.
3. Each student is to post a post a comment to a real world problem supplied by the teacher on the class wiki.
   1. Zoos have to make sure that the water the animals drink and play in stays clean from trash. However, materials get blown in the water all of the time. How can the zoos protect the animals from being harmed by materials that get into the water?
   2. How would relative density affect a pond or lake?

**Evaluate (Check for Understanding):**

1. Who caused the boat to sink in the video at the beginning of the lesson?
2. What causes something to sink or float in a liquid? Prepare a presentation with your group to share with the class to help students in other classes understand “relative density”. Students should be given free reign of what to choose using technology (ipad, itouches, flip camera, etc).

**Workstation**

* 1. Provide students with items to test. Use Workstation Data Sheet to record answers.

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Sink or Swim

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|  | **Sink or Float** | | | | | |
|  | Trial 1 | | Trial 2 | | Trial 3 | |
| Item | Prediction | Actual | Prediction | Actual | Prediction | Actual |
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Why do some items float and some sink? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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I changed the water to salt water and tested the materials. How would changing the type of liquid affect density? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_

Density Workstation

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|  | **Sink or Float** | | | | | |
|  | Trial 1 | | Trial 2 | | Trial 3 | |
| Item | Prediction | Actual | Prediction | Actual | Prediction | Actual |
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Why do some items float and some sink? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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